

Race: Biological Reality or Social Construct?

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Race was once thought to be a real biological kind. Today the dominant view is that objective biological races don't exist. I challenge the trend to reject the biological reality of race by arguing that *cladism* (a school of classification that individuates taxa by appeal to common ancestry) provides a new way to define race biologically. I also reconcile the proposed biological conception with constructivist theories about race. Most constructivists assume that biological realism and social constructivism are incompatible views about race; I argue that the two conceptions can be compatible.

1. Introduction. The history of the race debate can be summarized by considering the attitudes that theorists have taken towards three incompatible propositions.

BR: Races are biologically real.

SC: Races are social constructs.

I: Biological realism and social constructivism are incompatible views about race.

Many theorists assume, either implicitly or explicitly, that I is uncontroversial (Banton and Harwood 1975; Goldberg 1993; Omi and Winant 1994; Appiah 1996, 1992; Root 1998). Perhaps this is because I is a special case of the widely-held presumption that social constructivism is always an antirealist thesis (Stove 1991, Fine 1996). The disagreement is over whether races are biologically real or social constructs.

In the 19th and early 20th centuries, biological realism was the domi-

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nant view. Races were assumed to be biologically objective categories that exist independently of human classifying activities, and scientists worked towards substantiating this belief. They reasoned that races, if they exist objectively, must be some sort of subspecific taxa; that is, human races must be subspecies of *Homo sapiens*. Two definitions of ‘subspecies’ were offered. First there was the *typological subspecies concept*, which treats subspecies as natural kinds defined in terms of essential properties possessed by all and only the members of a subspecies (Mayr and Ashlock 1991). Later came the *geographical subspecies concept*. A ‘geographical subspecies’ is an aggregate of phenotypically and genetically similar breeding populations that inhabit their own geographic range and differ significantly from other such populations (Mayr and Ashlock 1991). Although both concepts eventually were rejected, each enjoyed a long reign as the accepted definition of human race.

The middle of the 20th century marked a change in point of view. Biologists began to question the biological reality of subspecies, and broad attacks were launched against the biological reality of race. In one argument, which I call the *no subspecies argument*, theorists maintain that there is no need to posit subspecific taxa for any organisms, including humans (Wilson and Brown 1953, Livingstone 1964). After the typological and geographical concepts were rejected, systematists began to express doubts about the possibility of providing a better definition. They argued that designating subspecies requires identifying *distinct units* and giving them formal names, but the boundaries between “subspecies” are often blurry. Furthermore, since systematists have other methods for studying intra-specific variation, the subspecies concept is dispensable.

In a second argument against the biological reality of race, theorists claim that even if non-human subspecies exist, there are no *human* ones; hence there are no races (Lewontin, Rose, Kamin 1984). I call this the *no human subspecies argument*. Support for this argument comes from detailed work in human genetics which reveals that there is almost as much genetic variation within racial groups (Africans, Asians, Caucasians) as there is between them (Lewontin, Rose, Kamin 1984, Nei and Roychoudhury 1993). Humans are supposedly too genetically similar to each other to justify dividing them into races.

Today, most theorists favor the view that races are social constructs. Although there are many types of social constructivism, as a view about race, constructivism is often formulated as a three-part thesis. The first part is a negative thesis, claiming that BR is false. This is a *local* claim. Race constructivism (RC) allows that some biological categories might be objective; it merely denies the biological reality of *race*. The second part is an explanatory thesis; it aims to explain the origins and persistence of beliefs in the biological reality of race. Constructivists often explain these

beliefs by appeal to ideological factors, such as the goal of reinforcing a social order that treats racial inequality as legitimate and inevitable. The third part is a positive thesis about the remaining ontological status of race. What *is* race if it is not a biologically objective category? Some constructivists argue that “race” is a social fiction; it is entirely a product of the ways that people think about human differences (Appiah 1992, Goldberg 1993). Others argue that race plays a prominent role in human social practices; hence, the social reality of race cannot be denied (Zack 1993, Omi and Winant 1994, Outlaw 1995, Appiah 1996, Root 1998).

In what follows I will set the latter two parts of RC to one side. Instead, I will focus on the assumptions that BR is false and that I is true. I will reject both assumptions. Contrary to popular belief, there *is* a biologically objective way to define race. Races can be defined in the way that cladistics determines its taxa, as sets of lineages that share a common origin. Moreover, as we will see later, the cladistic concept can coexist with a certain formulation of RC; in fact, there is a sense in which these theories are complementary.

2. Races Are Biologically Real. The philosophical debate concerning the status of systematic categories forms the basis of my examination of race. What is the foundation of an objective classification scheme within systematic biology? Pre-Darwinian naturalists often gave an Aristotelian answer to this question: a biologically objective classification scheme treats taxa as natural kinds defined by appeal to kind-specific essences (Mayr and Ashlock 1991). However, when essentialism fell into disrepute (because it was discovered to be at odds with contemporary evolutionary theory), systematists began debating two new possibilities: *phenetic* and *phylogenetic* classification. ‘Pheneticism’ defines taxa in terms of overall similarity. Populations of organisms are grouped into subspecies by a criterion of resemblance; subspecies are grouped into species by the same process, etc. ‘Phylogenetic classification’, on the other hand, defines taxa, specifically higher taxa, in terms of common ancestry.¹ Species that share a recent common ancestor belong to the same genus; species that share a more distant common ancestor belong to the same family, etc.

There are three important differences between these schools of classification. First, phenetic classifications are ahistorical; they define taxa in terms of the similarity of their members, with no reference to the genea-

1. There are two forms of phylogenetic classification—*evolutionary taxonomy* and *cladism*. ‘Evolutionary taxonomy’ uses common ancestry and adaptive similarity for defining taxa; ‘cladism’ relies solely on common ancestry. My definition of race relies on cladism, since evolutionary taxonomy fails to offer a non-arbitrary standard for when similarity matters more than descent (Sober 1993).

logical relations among organisms. In contrast, phylogenetic classifications are historical, since they define taxa in terms of evolutionary history. Second, pheneticism uses similarity to *define* its taxa. The phylogenetic concept, on the other hand, uses similarity as *evidence* for group membership, but taxa are not defined in this way. Finally, phenetic classifications are supposed to be theory neutral. Because pheneticists want an all-purpose classification scheme, no theoretical considerations are supposed to enter into phenetic classification. Phylogenetic classifications, on the other hand, are theory dependent. Because they aim to represent the patterns and processes of evolution, evolutionary theory plays an important role in phylogenetic classification.

Although both schools claim to be objective, only phylogenetic classifications are in fact objective (Ridley 1986). Phylogenetic classifications aim to represent the evolutionary branching process. Since this process exists independently of human classifying activities, phylogenetic classifications are themselves objective. The problem with pheneticism is that there is no reason to suppose that overall similarity represents an objective feature of reality. As Goodman has argued, “comparative judgments of similarity often require not merely selection of relevant properties but a weighting of their importance” (1970, 21). Because pheneticism defines taxa based upon overall similarity, it purports to take account of *all* of the properties that each individual possesses. However, it is difficult to understand what this totality is supposed to be (Sober 1993). First, there is a problem with understanding what counts as a character. For every organism, there is an infinite number of possible traits. Not only are there many different types of traits (e.g., phenotypic, genotypic, and behavioral) there are countless numbers of traits within each type. Furthermore, each trait can be described in many different ways (e.g., length, color, or hardness), can be divided in different ways (top half of the leg, top quarter, etc.), and can be combined in different ways. Because pheneticism aims for an all purpose classification scheme, it offers no non-arbitrary standard for choosing one method of character choice as the right one. The second problem is one of weighting. Once systematists have decided what counts as a trait, they need a way to weight their importance. Pheneticists suggest equal weighting, but again they offer no non-arbitrary reason for preferring equal weighting over another method. Finally, similarity itself can be spelled out in many different ways, which further augments pheneticism’s embarrassment of riches.

We are now in a position to see where many theorists have gone wrong in their reasoning about race. They presume that similarity ought to be the foundation of an objective classification scheme without considering the possibility that race can be defined historically. Not only is this assumption implicit in theoretical definitions of race (the typological concept requires

that the members of a race share a common essence, and the geographical concept requires overall similarity); it is also inherent in the standard arguments against BR. Defenders of the no subspecies argument advocate abandoning the subspecies concept in part because intraspecific variation is not discrete. Likewise, defenders of the no human subspecies argument reject human subspecific classification by claiming that humans are too genetically similar for races to be biologically real. Yet, as we have just seen, in other areas of systematic biology, shared history has largely replaced similarity as the foundation of an objective classification scheme. It follows that races, if they exist objectively, ought to be defined historically.²

Elsewhere, I have argued that race ought to be defined in the way that cladistics determines its taxa (Andreasen 1998). Cladism is a school of classification that defines taxa (traditionally, higher taxa) solely in terms of common ancestry (Hennig 1966). For example, by organizing sets of well-defined species into a branching structure, such as a phylogenetic tree, one can define higher taxa as monophyletic groups, as groups composed of an ancestor and all of its descendants. Let us consider Figure 1.

In this tree, the branches represent speciation events and the nodes represent well-defined species. Ancestral species A gives rise to two daughter species B and C, which in turn give rise to species D-L as depicted. Sober (1993) uses what he calls the “cut method” to illustrate the concept

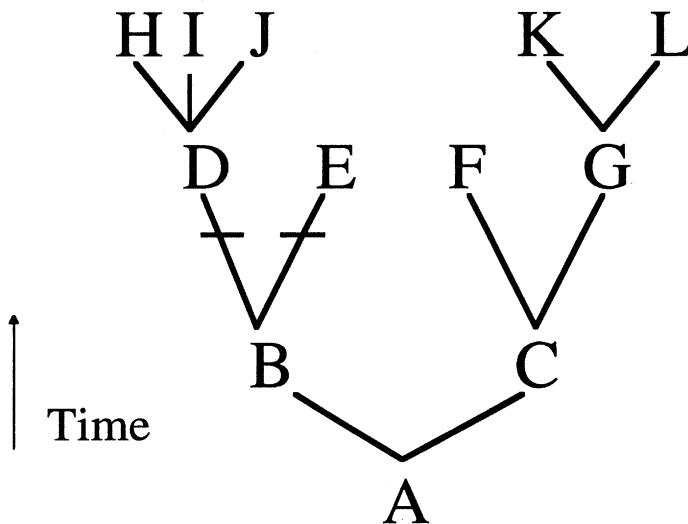


Figure 1.

2. A somewhat different version of this argument can be found in Andreasen 1998.

of monophyly. If we draw a cut across any branch, the nodes above that cut comprise a monophyletic group. For example, E is a monophyletic group, so is DHIJ, and so are many other groupings. In our tree, then, the terminal nodes (E, F, H-L) represent current species; the next largest monophyletic units (DHIJ and GKL) might represent genera, and so on up the taxonomic hierarchy.³

An important feature of the concept of monophyly is that the complement of a monophyletic group is not itself monophyletic. By applying the cut method to Figure 1, we can see that DHIJ is monophyletic, but the remaining species are not. Another important fact about monophyly is that it is rarely applied to reticulate structures, such as the one depicted in Figure 2. When the concept of monophyly is applied to a reticulate

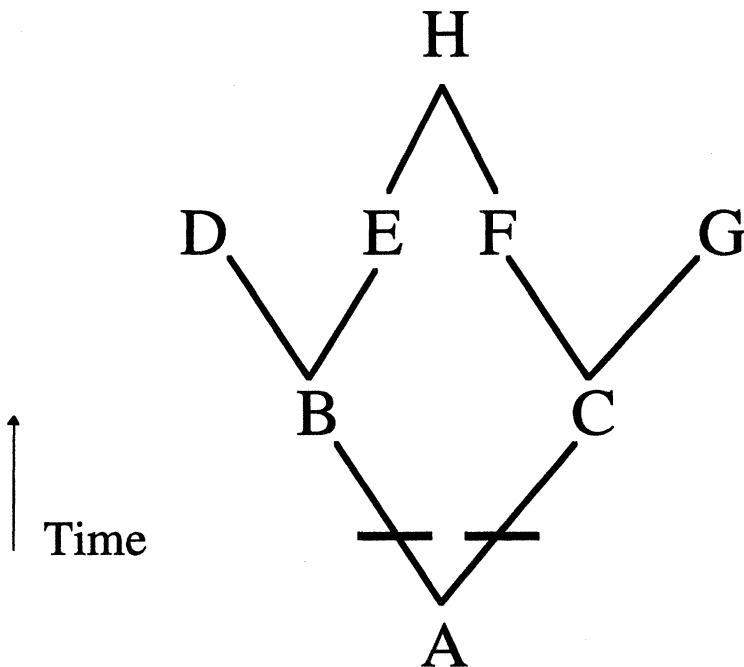


Figure 2.

3. Cladistic classifications have both a conventional and an objective aspect. The monophyletic groups are objective, but the way that monophyletic groups get assigned to a taxonomic level is conventional. For example, there is no fact of the matter about whether DHIJ and GKL comprise genera or families. Nonetheless, cladistic classifications are objective because they reflect the evolutionary branching process which is itself objective.

structure, the result is a partial overlap between monophyletic groups. Most systematists choose not to develop classifications in such cases. The reason is that when reticulation is extensive, partial overlap will also be extensive, resulting in a non-hierarchical classification scheme. Again the cut method is useful for seeing why this is so. If we draw two cuts as depicted, the result is two groups (BDEH and CFGH), which overlap partially.

Although the principles of cladistic classification were developed for defining higher taxa, they can be adapted for defining race. A cladistic view of race would require constructing a phylogenetic tree out of human breeding populations; the nodes would represent breeding populations and the branches would represent the births of new breeding populations. A ‘breeding population’ is a set of local populations that exchange genetic material through reproduction and are reasonably reproductively isolated from other such sets. For example, a tribe of bushmen might constitute a local population. When there is interbreeding among tribes, but no out-breeding, these local populations form a breeding population. A breeding population is ‘born’ when a local subpopulation becomes separated from its parent population and there is limited gene flow between “parent” and “offspring.” Separation often results from the introduction of geographic barriers; however, in the case of humans it can also be due to socio-cultural differences. Referring again to Figure 1, races can be defined as follows. The terminal nodes represent current breeding populations, the whole tree represents the human species, and the nested hierarchy of monophyletic units represents a nested hierarchy of races.⁴

Support for this view comes from current work in human evolution. For some time now, anthropologists have been gathering data on the genetics of contemporary populations. Using these data, they can estimate degrees of relatedness among human breeding populations and can reconstruct human evolutionary history (Cavalli-Sforza 1991, Wilson and Cann 1992, Nei and Roychoudhury 1993). For example, Cavalli-Sforza gathered data on 120 different gene states within 42 aboriginal populations (populations that have remained largely reproductively isolated since the late 15th century).⁵ Next, he calculated the gene frequency differences (or genetic distances) between populations and used these data to estimate

4. Kitcher (1998) has independently proposed a similar definition of race. Like me, he defines races as reasonably reproductively isolated breeding populations. I, however, add that races ought to be monophyletic groups. We also provide different kinds of support for our views. Kitcher uses contemporary data on the rates of interbreeding between major racial groups; I use current work in human evolution. Finally, Kitcher is more optimistic than I am about the existence of races today; I wish to remain agnostic on this issue (see Andreasen 1998).

5. I chose Cavalli-Sforza’s research over the alternatives because it is the most comprehensive and uses the largest amount of data.

ancestral relations. He reasoned that when two populations are reasonably reproductively isolated over long periods of time, mutations occur and gene frequency differences accumulate. Thus, other things being equal, the larger the genetic distance between two populations, the more distant their ancestral relation. Finally, he confirmed the accuracy of his measures by comparing them with several widely accepted dates suggested by the geological record. For example, the largest genetic distance was between Africans and non-Africans; this distance was approximately twice that between Australians and Asians and was roughly four times the distance between Europeans and Asians. Paleoanthropological research indicates that the dates of separation between breeding populations are in similar ratios: “~100,000 years for the separation between Africans and Asians, about 50,000 years for that between Asians and Australians, and ~35,000 years for that between Asians and Europeans” (Cavalli-Sforza 1991, 106). The result of this research is the following phylogenetic tree.

This tree represents a racially undifferentiated stock of modern humans evolving in Africa ~200,000 years ago. The first split divides Africans from all other populations. The second split represents a division between Pacific-Southeast Asians and the rest of the world. After that division, the Australopapuans diverged from the rest of Pacific-Southeast Asia, and the fourth split separates northeast Asians and Amerindians from European and non-European Caucasoids.

Some of the above conclusions are controversial. Not only is there controversy surrounding Cavalli-Sforza’s method of tree reconstruction;

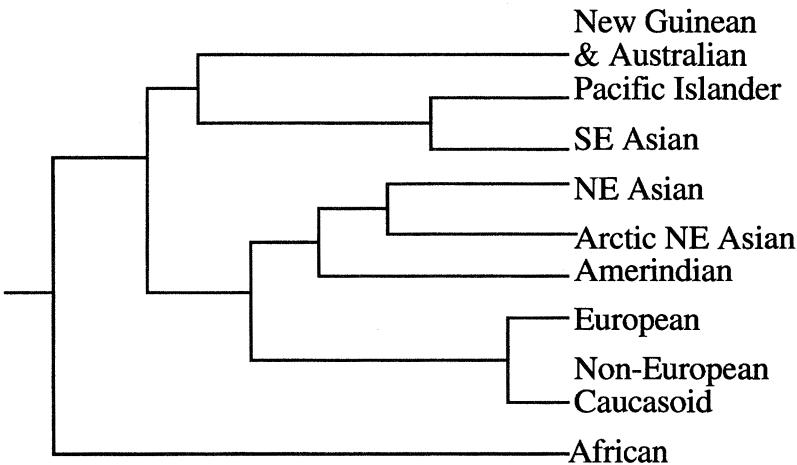


Figure 3.

there is some controversy over the specifics of his tree.⁶ However, these difficulties need not concern us here. What is important for our purposes is the following conceptual point. Cavalli-Sforza's research illustrates that it is possible to reconstruct human evolutionary history, and this means that it is possible to provide a cladistic definition of race. Even if the empirical details change, this conceptual point will remain in place.

3. Reconstructing Race Constructivism. We have just seen that the standard arguments against the biological reality of race are unacceptable because they overlook the possibility that race can be defined cladistically. What does this tell us about the thesis of RC? Since most versions assume that races are biologically unreal, one might think that races cannot be social constructs. However, this is not the case. The cladistic view may be incompatible with the standard formulation of RC, but there is a weaker formulation that can coexist with cladism.

When talking about the objective nature of race, there are two kinds of questions that one might ask. First, there are sociological questions concerning how races are conceptualized in different societies. How do people in different societies think about race? What influence do popular conceptions have over a person's self-identity or the identification and treatment of others? Does biology lend support to common sense (CS) conceptions of race? Second, there are biological questions about the extent and nature of human racial variation. Is there a biologically objective way to define subspecies? Can this concept be applied to humans? How much variation is there within each race as compared with that between races?

Although there is some overlap between these sets of questions, they are largely autonomous. Sociologists are mostly interested in CS conceptions of race. Their primary aim is to understand the role that the race concept has played, and continues to play, in human social organization, and this understanding is gained by examining popular beliefs. Answers to the biological questions are useful to the extent that they provide information about whether CS conceptions are biologically real. Yet, if systematists were to discover a biologically objective definition that departs substantially from the CS view, the sociological questions would still be worth asking.

Biologists, on the other hand, want to know whether there is *any* biologically objective way to define race (CS or otherwise). Their aim is to determine whether race represents an objective feature of reality. They might begin by testing the empirical foundations of CS, but if popular conceptions prove to be biologically unjustified, objective biological races

6. I have discussed these difficulties in Andreasen 1998.

might still exist. The objectivity of a kind, biological or otherwise, is not called into question by the fact that ordinary people have mistaken beliefs about the nature of that kind. Those familiar with the causal theory of reference for natural kind terms will be aware of this possibility. According to this theory, natural kind terms have their reference fixed by a baptismal procedure. A speaker indicates what she means by a term either by ostension or by appeal to definite descriptions. The kind is then defined as the class of things that bears the appropriate “sameness relation” to typical samples of that kind (Kripke 1972, Putnam 1975). Ordinary people need not know the conditions for kind membership. The descriptions associated with a kind term do not form part of its meaning, thus even if scientists were to later discover that some of these descriptions are false of the objects originally referred to, the term is still taken to refer.

Yet, my point does not depend on the specifics of the causal theory. One can find in the history of science many instances to support the idea that the objectivity of a kind is not undermined by the fact that ordinary people have mistaken beliefs about its nature. For example, CS has told us that glass is a solid, whales are fish, bats are birds, species have essences, and the heavenly bodies are immutable. Science, however, treats glass as a liquid, whales and bats as mammals, species as lineages without essences, and the heavenly bodies as changeable. In instances such as these, people need not, and often do not, conclude that the kinds in question do not exist. These kinds *do* exist; it is just that ordinary people have (or have had) mistaken beliefs about the natures of these kinds.

It follows that the statement ‘races are biologically unreal’ is ambiguous. It could mean that biology fails to vindicate CS conceptions of race, or it could mean that there are no biologically objective ways to define race (CS or otherwise). Although constructivists have traditionally tried to defend the stronger claim, they have not succeeded. However, as I am about to argue, they *can* defend a weaker claim—namely, that most CS beliefs about the biological reality of race are empirically unjustified.⁷ This would make RC a three-part thesis about CS conceptions only. As already mentioned, the first part would be the claim that biology lends no support to CS beliefs about the biological reality of race. The second part would explain these false beliefs by appeal to ideological factors. The third part would focus on the social reality, or lack thereof, of CS conceptions of race.

To see that this revision is in keeping with the spirit of RC, let us consider the constructivist project. Constructivists are interested in the sociology of race and race relations. They start with the observation that race often plays a prominent role in human social organization. In the

7. Zack (1993) is a constructivist who limits her constructivism to this weaker claim.

United States, for example, race is a central component of many social policies, many people's identities, and the identification and treatment of others. Constructivists want to understand the concepts of race that are at work in these cases. Of particular interest are invidious conceptions of race, since they often play a role in racist social practices and institutions. Constructivists want to expose these CS conceptions as myths in the hope that our society can begin to move beyond racism.

Although it is ultimately an empirical question what people mean by 'race', very little empirical research has in fact been done on this issue. Even so, there are still some things that can be said about CS beliefs about race. According to some historians, most people in the 19th and early 20th centuries believed that all humans can be sorted into three or more races based upon shared inherited characteristics (Banton and Harwood 1975). Informally, races are demarcated by appeal to observable properties (e.g., skin color, hair type, and eye shape). Yet, many people also assume that these properties are good predictors of more significant inherited differences (e.g., behavioral, intellectual, or physiological differences). I will assume that this concept forms the core of CS beliefs about the biological reality of race. This is not to suggest that all people hold these beliefs. Perhaps many people believe that races are biological arbitrary. Nor am I suggesting that these beliefs are exhaustive of CS. For example, some people probably assume that a person's race is partly determined by her ancestry, others might believe in shared racial essences, and, unfortunately, some people believe in racial superiority. I am merely claiming that this concept has played, and still plays, an important role in many Western societies. As such, it is the type of concept that constructivists ought to be concerned with when they reject BR.

The central problem with this concept is that it defines races solely in terms of the similarities of their members. However, there is no reason to suppose that these similarities (e.g., skin color, hair type, etc.) represent biologically interesting features of reality. Moreover, although the members of different races differ with respect to their gross morphology, there are few other statistically significant inherited differences among the races. As noted earlier, genetic studies reveal that the genetic variation within CS racial groups is almost as great as that between groups (Lewontin, Rose, and Kamin 1984; Nei and Roychoudhury 1993). Thus, apart from a small handful of arbitrarily selected visible characteristics, the members of different races are not all that different.

4. Proposition I Is False. I have just argued that RC ought to be reformulated as a thesis about CS conceptions only. I will now show that the cladistic concept poses no threat to this reformulation of RC. The reason is that it deviates from CS in several important ways. It will follow from

this that I is false: Biological realism and social constructivism can sometimes be compatible views about race. Defenders of I often presume that there is a single (CS) meaning of the term ‘race’. I argue, however, that the term is ambiguous.

It is often part of CS that the members of a race share many traits with each other that they do not share with members of other races. According to the cladistic view, however, similarity is neither necessary nor sufficient for race membership. Individuals are members of a cladistic race iff they belong to breeding populations that share a common origin. This will be true regardless of how closely they resemble each other. If two individuals, A and B, are very similar and both differ greatly from a third, C, it still may be true that A and C are in the same race but B is not, if A and C (but not B) are closely related genealogically. As already mentioned, similarities and differences among individuals provide *evidence* for race membership, but cladistic races are not *defined* in this way.

A second feature of CS is the assumption that biological races are *static* categories. Many people probably assume that there will always be the same number of racial groups. The members of a race may change, but the categories themselves never change. However, according to the cladistic view, races can be *dynamic* categories: Not only can races go extinct, new races can come into existence. As we saw above, cladistic classification, if it is to be hierarchical, requires that evolution take the form of a branching process. Subspecific evolution will take this form whenever two breeding populations experience different evolutionary forces under a significant degree of reproductive isolation. Thus, if there is significant outbreeding between two previously isolated breeding populations, these races will go extinct. Similarly, if a subpopulation splits from its parent population, and the two populations are reasonably reproductively isolated over a long period of time, a new race will be born.

Finally, most people divide humans into at least three racial groups (Caucasians, Africans, and Asians). However, if we apply the concept of monophyly to the tree depicted in Figure 3, the result is a nested hierarchy of races that cross-classify these standard groupings. Caucasians and Africans are cladistic races, but Asians are not. The reason is that “Asians” do not form a monophyletic group. Pacific-Southeast Asians are more closely related to Australopapuans than they are to Northeast Asians. Moreover, Northeast Asians are more closely related to Amerindians and Caucasians than they are to Southeast Asians. Because there is no group that includes both Southeast and Northeast Asians that does not also include Caucasians, “Asians” do not form a cladistic race.

At this point, one might object that my use of the term ‘race’ is misleading. The worry is that cladistic races deviate *too far* from CS. If two individuals can be similar in nearly all respects, but be members of differ-

ent “races” (or if two individuals can differ significantly in their gross morphology and be members of the same “race”) then cladistic “races” are not really races. Moreover, the fact that the cladistic concept cross-classifies our standard racial categories might seem to be a further reason for thinking that I am not really talking about race.

Although I agree that the above results are somewhat counterintuitive, they reflect two reasonably common patterns within systematic biology. The possibility that two individuals can differ a great deal and be members of the same race (or that they can be quite similar and be members of different races) is merely the result of defining taxa historically. The same possibilities arise with species and higher taxa, which are also defined historically (Hull 1978). Since it would be a mistake to use this point to deny that species or higher taxa exist, we should not use it to reject the cladistic view of race. Even in the face of cross-classification, it is unacceptable to deny the existence of cladistic races. There are many cases of cross-classification between scientific and CS categories. As I mentioned above, CS once told us that whales are fish, bats are birds, and glass is a solid. Science, on the other hand, says otherwise. In these cases, people did not conclude that the kinds in question do not exist; again, we should not do so in the case of race.

Finally, there might be cause for concern if the cladistic concept were to retain *no* elements of CS. However, there are at least two important elements of CS that the cladistic concept retains. First, many people believe that races are subspecies; they are biologically objective categorical subdivisions of *Homo sapiens*. Second, shared ancestry has played, and probably continues to play, an important role in the ways that ordinary people think about race. This was especially true prior to the 19th century, before essentialism was the dominant view about race (Banton and Harwood 1975); however, I suspect it is largely true even today. These two elements of CS are also central to the cladistic concept, hence there is little or no reason to conclude that cladistic races are not really races.

5. Conclusion. In this paper I opposed the trend to reject BR by arguing that cladism, in conjunction with current work in human evolution, provides a new way to define race biologically. I also rejected the widely held assumption that biological realism and social constructivism are incompatible. The reason is that the cladistic concept falls outside the race constructivist’s appropriate domain of inquiry.

REFERENCES

Andreasen, Robin (1998), “A New Perspective on the Race Debate”, *British Journal for the Philosophy of Science* 49: 199–225.
 Appiah, Kwame (1992), *In My Father’s House*. New York: Oxford University Press.

———. (1996), “Race, Culture, Identity”, in Kwame Appiah and Amy Gutmann (eds.), *Color Conscious*. Princeton: Princeton University Press, 30–105.

Banton, Michael and John Harwood (1975), *The Race Concept*. London: David and Charles.

Cavalli-Sforza, Luigi (1991), “Genes, Peoples, Languages”, *Scientific American* 265: 104–110.

Fine, Arthur (1996), “Science Made Up”, in David Stump and Peter Galison (eds.), *The Disunity of Science*. Stanford: Stanford University Press, 231–254.

Goldberg, David (1993), *Racist Culture*. Cambridge: Blackwell.

Goodman, Nelson (1970), “Seven Strictures on Similarity”, in Mary Douglas and David Hull (eds.) *How Classification Works*. Edinburgh: Edinburgh University Press, 13–23.

Hennig, Willi (1966), *Phylogenetic Systematics*. Urbana: University of Illinois Press.

Hull, David (1978), “A Matter of Individuality”, *Philosophy of Science* 45: 335–360.

Kitcher, Philip (1998), “Race, Ethnicity, Biology, Culture”, unpublished manuscript.

Kripke, Saul (1972), *Naming and Necessity*. Cambridge, MA: Harvard University Press.

Lewontin, Richard, Steven Rose, and Leon Kamin (1984), *Not in Our Genes*. New York: Pantheon.

Livingstone, Frank (1964), “On the Nonexistence of Human Races”, in Ashley Montagu (ed.), *The Concept of Race*. New York: Collier Books, 46–60.

Mayr, Ernst and Peter Ashlock (1991), *Principles of Systematic Zoology*, 2nd ed. New York: McGraw-Hill.

Nei, Masatoshi and Arun Roychoudhury (1993), “Evolutionary Relationships of Human Populations on a Global Scale”, *Molecular Biology and Evolution* 10(5): 927–943.

Omi, Michael and Howard Winant (1994), *Racial Formation in the United States*, 2nd ed. New York: Routledge.

Outlaw, Lucius (1995), “On W. E. B. Du Bois’s ‘The Conservation of Races’”, in Linda Bell and David Blumenfeld (eds.), *Overcoming Racism and Sexism*. Lanham, MD: Rowman and Littlefield, 79–102.

Putnam, Hilary (1975), “The Meaning of Meaning”, in Hilary Putnam (ed.), *Mind, Language, and Reality*. Cambridge: Cambridge University Press, 215–271.

Ridley, Mark (1986), *Evolution and Classification*. London: Longman.

Root, Michael (1998), “How We Divide the World”, this issue.

Sober, Elliott (1993), *Philosophy of Biology*. Boulder: Westview Press.

Stove, David (1991), *The Plato Cult and Other Philosophical Follies*. Cambridge: Basil Blackwell.

Wilson, Allan and Rebecca Cann (1992), “The Recent Genesis of Humans”, *Scientific American* 266: 68–73.

Wilson, Edward and William Brown (1953), “The Subspecies Concept and Its Taxonomic Application”, *Systematic Zoology* 2: 97–111.

Zack, Naomi (1993), *Race and Mixed Race*. Philadelphia: Temple University Press.